



Techniques for Project Planning and Effects on Real Estate Management

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ABSTRACT: Effective project management is crucial in the real estate industry for successful ventures. However, every project has unique complexities affecting budget overruns and regulatory compliance. This paper aims to explore the impact of project planning techniques on real estate management, with a specific focus on the direction of cost control within real estate projects. Through an in-depth analysis of an actual case study of a real estate project and the utilization of the DEMATEL method, we have extensively examined the primary factors influencing cost management within the project. We have identified four critical factors: comprehensive cost management, cost management involving all team members, cost risk management, and enhancement of the cost management system. These factors play a pivotal role in project planning techniques and have a significant impact on cost control within real estate projects.

KEYWORDS: Cost Management, Influencing Factors.

I. INTRODUCTION

In the 40 years since the reform and opening up, China's real estate industry has been in a stage of rapid development. Real estate has become an important factor affecting China's economic development, and has gradually attracted the attention of the government. In combination with the current situation of China's real estate development and the needs of society, it has formulated A series of policies to stabilize the market structure.

The real estate industry is an important carrier of new urbanization development. The current population improvement demand and the new urban population housing demand in the next five years require real estate development as a premise to achieve. At present, China's economic

growth is increasingly dependent on consumption growth. In the country's economic development plan, housing consumption has become an important factor in consumption growth. This means that the real estate industry will continue to develop further in the future. However, China's real estate industry has entered a deepening adjustment cycle. In the long run, the scale and market space of the real estate market will tend to be stable, and industry competition will become more intense.

How can real estate companies survive? Drucker's famous management quote: Within an enterprise, there are only costs. Since the external policy environment cannot control it, we can only do a good job within our own company and strengthen internal cost management. Only in this way can we ensure that we can obtain the established profits and have money to buy clothes and food in the cold winter, so as not to freeze to death. starve. In order to cope with the increasingly uncertain external complex environment, real estate companies must improve the level of corporate project cost management, pay attention to project cost management work, and regard project cost management work as the focus of project management work, because only by strengthening project cost management can real estate companies establish competition. advantages and the ability for continued development. At present, the research and application of comprehensive cost management in domestic real estate enterprises is still quite lagging behind. Some enterprises have no concept at all, and some enterprises have corresponding systems, but the systems are not perfect and cannot be implemented in place.

This article analyzes each stage of the whole process of Y Center real estate project development to further fully understand and master the cost control rules at each stage of real estate development, and to achieve comprehensive cost



management control of real estate enterprises, so that the cost management level of real estate enterprises can be continuously improved.

II. ANALYSIS OF KEY INFLUENCING FACTORS OF Y CENTER REAL ESTATE PROJECT COST MANAGEMENT

2.1 ANALYSIS OF SURVEY QUESTIONNAIRE SAMPLES

The selection of experts for the questionnaire survey was meticulously executed, encompassing a diverse array of departments within Y Real Estate Development Limited Company. The cohort of participants featured esteemed leaders and colleagues hailing from an assortment of functional management centers and a plethora of functional departments nestled within the expansive domain of the W Project Management Department.

To ensure robustness and comprehensiveness in the survey sample, a total of 60 questionnaires were judiciously distributed

among the selected participants. This distribution was strategically designed to encompass a well-rounded representation of perspectives from various corners of the organizational spectrum. Within this distribution framework, a specific focus was accorded to the Cost Management Department, with 25 questionnaires being dispatched to this pivotal domain. This allocation translated to a significant proportion of 41.7% of the total survey sample.

It is noteworthy that meticulous attention was directed towards fostering equitable representation across all departments engaged in the survey. To achieve this, each of the remaining departments was allocated no less than 3 questionnaires. This conscientious allocation strategy was employed to counterbalance potential biases that could emerge from an uneven distribution of questionnaires.

2.2 ANALYSIS OF SURVEY QUESTIONNAIRE RESULTS

The detailed results of the importance level of influencing factors are shown in Table 2-1:

Table 2.1 : Impact Factor Importance Scores

No.	Influence Factor	Questionnaire Number	Minimum Value	Maximum Value	Average Value
1	Rationality of Cost Ceiling Design	60	1	4	3.41
2	Cost Management Planning	60	1	3	4.02
3	Information System Integration	60	1	4	3.21
4	Cost Assessment Mechanism	60	2	5	3.91
5	Comprehensive Cost Management by All Employees	60	1	5	4.23
6	Investment Estimation Accuracy	60	2	3	3.42
7	Improvement of Investment Decision Mechanism	60	2	5	4.05
8	Enhancement of Cost Management System	60	2	5	4.05



9	Project Breakdown Structure	60	2	4	3.32
10	Organizational Structure Establishment	60	2	5	4.09
11	Inspection and Audit System	60	2	5	4.05
12	Human Resources Training	60	2	3	3.42
13	Change Management	60	2	5	3.98
14	Energy-efficient and Environmentally Friendly Design	60	1	3	3.02
15	Quality Control	60	1	5	4.03
16	Schedule Management	60	2	4	3.14
17	Holistic Element Coordination Management	60	2	5	3.96
18	Cost Risk Management	60	2	5	3.12
19	End-to-End Cost Management	60	1	5	4.21

Illustrated in Table 2-1, the distribution of importance level scores assigned to each individual factor spans a relatively uniform range, spanning from 3.02 to 4.23. This uniformity in scoring underscores the consistent weighting accorded to the factors by the panel of experts. It's discernible that these experts, well-versed in their domain, have arrived at a consensus regarding the significance of these factors, as evidenced by the relatively balanced allocation of scores across the spectrum.

In the context of the W Project's inaugural phase, it is noteworthy that the surveyed participants originate exclusively from Y Company. This selective pool of respondents hails from a vantage point of profound familiarity with the intricacies of

the project's cost management intricacies. Leveraging their insightful perspectives, we are poised to gain an incisive understanding of the actual cost management landscape encompassing the first phase of the W Project.

By virtue of this focused respondent base, the average values emerge as robust and reliable metrics for gauging the authentic status of cost management in the W Project's initial phase. Employing these average scores as a benchmark, we can meticulously identify and delineate the 10 pivotal factors wielding influential sway over cost management, thereby encapsulated in the visual representation of Table 2-2.



Table 2.2 : Factors Influencing Cost Management in the First Phase of the W Project in Real Estate

Sign	Influence Factor
H1	Improvement of Investment Decision Mechanism
H2	Cost Risk Management
H3	Change Management
H4	Inspection and Audit System
H5	Enhancement of Cost Management System
H6	Comprehensive Cost Management by All Employees
H7	Cost Assessment Mechanism
H8	Holistic Element Coordination Management
H9	Organizational Structure Establishment
H10	End-to-End Cost Management

2.3 DETERMINING THE RELATIONSHIPS AMONG INFLUENCING FACTORS AND ESTABLISHING THE DIRECT INFLUENCE MATRIX

2.3.1 SELECTION OF EXPERT PANEL

To ensure the accuracy of the interviews, a detailed design was implemented for expert selection:

1.Experts were chosen from different real estate companies;

2.They possessed over 7 years of experience in the real estate industry;

3.Their positions had to be at the managerial level with team management responsibilities;

Expert panel members primarily focused on cost management, while also including professionals in project management, design management, financial management, and related fields.

2.3.2 IN-DEPTH INTERVIEW CONTENT

After comprehensive research, this study has identified 10 key factors influencing project cost management. The next step involves further investigating the direct relationships among these factors. By creating a chord diagram of the major influencing factor relationships, we can discern the interconnections among these factors. Hence, the

subsequent phase involves establishing the direct influence matrix based on the chord diagram: when element H_i has a direct influence on element H_j , an arrow should be drawn from H_i to H_j ; conversely, no arrow is needed. This arrow direction signifies one-way influence, while bidirectional arrows represent mutual influence. This method accurately identifies the logical relationships among influencing factors, aiding in matrix construction and utilizing the DEMATEL algorithm to conduct calculation and analysis of these factors.

2.3.3 CONSTRUCTING THE MAIN INFLUENCE RELATIONSHIP CHORD DIAGRAM

By synthesizing the interview insights from various experts, we ultimately determined the relationships among the different influencing factors. Subsequently, we constructed a chord diagram to depict these relationships, as illustrated in Figure 4-1. In this chord diagram, each influencing factor is represented as a point arranged around the circumference, and the connections between them are visualized as chords. The width and color of the chords can indicate the attributes and strengths of the connections. Chord diagrams serve as a valuable visual tool to showcase interactions and dependencies among different elements.

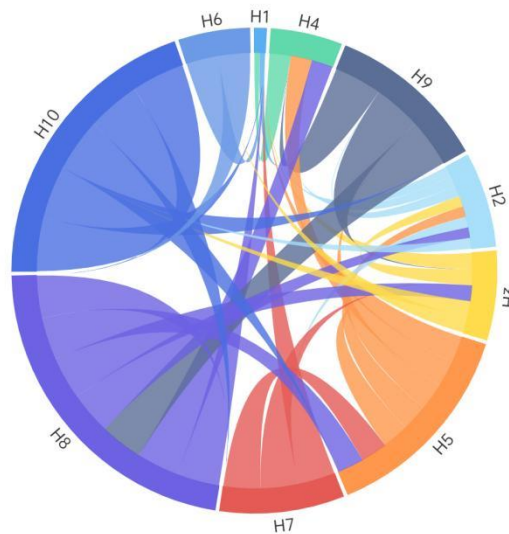


Figure 2.1: Main Influence Factor Chord Diagram

2.4 ESTABLISHING THE DIRECT INFLUENCE MATRIX

The determination of scores in accordance with the depicted Chord Diagram showcasing the interplay of influence relationships among various factors is structured by clear rules. These rules serve to impart a systematic basis for assigning scores to the relationships between influencing factors, thus rendering insights into their reciprocal influences. The principles guiding these scores are as follows:

Firstly, when a factor denoted as H_i exerts a direct influence over another factor labeled as H_j , while H_j doesn't reciprocate this influence onto H_i , the score assigned to this directional relationship, represented as H_{ij} , is 1. This signifies a unidirectional influence from H_i to H_j . Correspondingly, the reverse influence score, denoted as H_{ji} , remains at 0, reflecting the lack of a direct influence from H_j to H_i . This one-sided influence scenario is strategically captured through these score assignments.

Conversely, in cases where both factors exhibit mutual influences upon each other, a symmetrical and reciprocal influence dynamic

exists. Therefore, in such scenarios, both H_{ij} and H_{ji} are assigned a value of 1. This bilateral influence signifies a mutual interplay between the factors, wherein each influences the other in a bidirectional manner.

However, it's noteworthy that scenarios devoid of direct influence connections between two factors result in scores of 0 for both H_{ij} and H_{ji} . This score assignment delineates the absence of direct influence interactions between the respective factors, indicating their autonomy from one another in the context of influence.

It's essential to emphasize that self-influence, where a factor influences itself, is inherently excluded from the scoring process. The focus lies on the interplay between distinct factors, and thus, self-influence isn't considered within the scoring framework. Employing these score-assigning rules, the construction of the direct influence matrix denoted as matrix B transpires (Table 2-3).

Table 2.3: Direct Influence Matrix B

Sign	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
H1	0	1	0	0	0	1	0	0	0	1
H2	0	0	0	0	0	1	0	0	0	0
H3	0	0	0	1	1	0	1	0	1	0



H4	0	0	0	0	0	1	1	0	0	1
H5	0	0	0	0	0	1	0	0	0	1
H6	0	1	1	1	1	1	1	0	0	1
H7	1	1	0	0	0	1	0	1	0	1
H8	0	0	0	0	0	1	0	0	0	1
H9	1	1	0	0	0	1	0	0	1	1
H10	0	0	1	1	0	1	0	0	0	0

2.5 ESTABLISHING THE COMPREHENSIVE INFLUENCE MATRIX

This study employs the matrix correlation method based on the maximum row sum normalization to uncover the underlying relationships hidden within the data by normalizing matrix elements.

In our research, we consider a mathematical expression, where matrix B represents an n x n data matrix. Each element in matrix B corresponds to the value in the i-th row and j-th column of the data matrix. The numerator of the expression is the matrix B itself.

The denominator, , introduces the maximum value of the sum of each row's elements in the data matrix. This step aims to compare each element with the sum of the data in its respective row, highlighting the elements that significantly influence each row.

By normalizing each element in matrix B, we obtain a new matrix C with the same dimensions as matrix B. Each element in matrix C represents the relative proportion of the original data element

in its respective row, essentially adjusting its weight relative to others.

In other words, by summing the factors in each row of the direct influence matrix B, selecting the maximum value, and dividing matrix B by that maximum value, we obtain a standardized direct influence matrix C, as calculated by the following formula:

$$C = B / \max_{1 \leq i \leq n} \sum_{j=1}^n b_{ij} = (c_{ij})_{n \times n}$$

(Equation 2.1)

Following this,

$$T = C(E - C)^{-1}$$

(Equation 2.2)

utilizing the matrix calculation functions MINVERSE and MMULT in Excel, we calculate the comprehensive influence matrix T, as detailed in Table 2-4 below:

Table 2.4: Direct Influence Matrix T

Sign	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
H1	0.37	0.33	0.48	0.46	0.65	0.18	0.48	0.45	0.52	0.22
H2	0.37	0.39	0.55	0.52	0.74	0.21	0.54	0.62	0.53	0.33
H3	0.52	0.40	0.33	0.32	0.51	0.25	0.5	0.43	0.32	0.34
H4	0.52	0.41	0.38	0.34	0.63	0.17	0.37	0.54	0.43	0.21
H5	0.53	0.45	0.54	0.50	0.53	0.13	0.53	0.52	0.52	0.26
H6	0.61	0.22	0.28	0.25	0.44	0.14	0.25	0.42	0.32	0.13



H7	0.36	0.23	0.39	0.13	0.38	0.14	0.23	0.26	0.35	0.12
H8	0.29	0.45	0.54	0.45	0.55	0.15	0.53	0.42	0.53	0.23
H9	0.64	0.31	0.46	0.43	0.46	0.13	0.42	0.43	0.32	0.24
H10	0.32	0.42	0.41	0.36	0.53	0.13	0.52	0.52	0.53	0.21

2.6 DETERMINING KEY INFLUENCING FACTORS

(Equation2.3)

Based on the direct influence matrix T, further analysis of the comprehensive impact relationships among the factors influencing cost management in the first phase of the W Project in real estate is conducted. This involves calculating the impact degree D, affected degree R, centrality degree M, and causality degree U for each factor. Here, $M = D + R$, representing the position and significance of a factor among all factors and its impact size; $U = D - R$. If the causality degree is positive, the factor is considered a causative factor if it has a significant impact on other factors; otherwise, it is regarded as an effect factor. The formulas for these calculations are as follows:

$$R_i = \sum_{i=1}^n T_{ij}$$

(Equation2.4)

$$M = D_i + R_i$$

(Equation2.5)

$$U = D_i - R_i (1 \leq i, j \leq n)$$

(Equation2.6)

$$D_i = \sum_{j=1}^n T_{ij}$$

Table 2.5: Calculation results of influencing factors

Influencing Factor	Impact Degree_D	Affected Degree_R	Centrality Degree_M	Causality Degree_U
H1	3.62	4.53	6.99	-0.91
H2	4.74	3.65	6.83	0.96
H3	3.82	4.42	6.69	-0.6
H4	3.96	3.99	6.29	-0.03
H5	4.58	4.53	7.58	0.06
H6	3.01	1.99	3.58	0.98
H7	2.86	4.27	5.70	-1.41
H8	4.30	4.76	7.52	-0.46
H9	3.94	4.73	7.19	-0.79
H10	4.04	4.46	4.84	1.35



Based on the aforementioned calculations, considering only the causality degree U , the influencing factors in cost management of the first phase of the W Project in real estate, listed in descending order of their impact degrees, are as follows:

- H10 - Comprehensive Cost Management
- H6 - Cost Management by All Employees
- H2 - Cost Risk Management
- H5 - Enhancement of Cost Management System.

To enhance real estate project cost control, the following suggestions and countermeasures can be derived from the findings:

1. Comprehensive Cost Management (H10): With its highest impact degree, adopting a comprehensive cost management approach becomes imperative. This involves meticulous cost scrutiny across the project's lifecycle. Real estate developers should establish robust cost-monitoring mechanisms that encompass all project phases, regularly reviewing and adjusting budget allocations to preempt potential cost overruns.

2. Cost Management by All Employees (H6): Acknowledging cost control as a collective responsibility, cultivating a culture of cost consciousness among all project participants is pivotal. Organizing training sessions that sensitize team members to cost implications in decision-making can foster a sense of ownership and innovation in cost-saving strategies.

3. Cost Risk Management (H2): Proactive identification of potential cost-related risks during the project's early stages is paramount. Real estate companies should institute a robust risk assessment framework to gauge unforeseen events' potential impact on project costs. Having contingency plans for identified risks can mitigate adverse effects of cost fluctuations due to external factors.

4. Enhancement of Cost Management System (H5): The integration of an advanced cost management system can significantly bolster cost control efforts. Real estate organizations should invest in modern software tools and technologies for real-time cost tracking, data analysis, and forecasting. This empowers informed decision-making and early identification of budget deviations.

In conclusion, the research advocates a prioritized approach to real estate project cost control. By emphasizing comprehensive cost management, involving all personnel in cost considerations, addressing cost-related risks, and enhancing the cost management system, real estate projects can adeptly navigate budgetary challenges and secure successful outcomes.

III. CONCLUSION

In summary, this paper delves deep into the profound impact of project planning techniques on real estate management, with a specific focus on the realm of cost control within real estate projects. Through the application of the DEMATEL method to an actual case study, we have analyzed the principal factors influencing cost management and pinpointed four key factors: comprehensive cost management, cost management involving all team members, cost risk management, and enhancement of the cost management system. These findings contribute to an enhanced understanding of the significance of project planning techniques in real estate management, particularly highlighting the pivotal role of cost control in enhancing both the economic and societal benefits of real estate projects.

IV. FUTURE OUTLOOK

Despite achieving certain results in the study of project planning techniques and their impact on real estate management, there are still several research directions and practical prospects worth further exploration:

1. Technological Advancement and Digital Transformation: The rapidly accelerating digital landscape presents a fertile ground for probing the symbiotic relationship between real estate project planning techniques and cutting-edge technologies like artificial intelligence and big data analysis. Delving into how these digital tools can amplify the efficiency, accuracy, and foresight of project planning techniques is an avenue ripe for exploration.

2. Cross-Disciplinary Exploration: The realm of real estate management intersects with diverse spheres such as marketing and legal regulations. Nurturing interdisciplinary research that interweaves these domains can furnish a panoramic comprehension of how project planning techniques reverberate across a multifaceted spectrum, fostering a more profound grasp of their impact.

3. Sustainability Integration and Project Planning: The resonant chord of sustainability warrants careful consideration. Exploring how project planning techniques can be symbiotically entwined with sustainability principles amplifies the prospect of attaining equilibrium between economic prosperity, environmental stewardship, and social progress.

In sum, these directions for future research illuminate a promising path toward a richer and more holistic understanding of the interplay



between project planning techniques and the multifaceted tapestry of real estate management. As the domain continues to evolve, these trajectories promise to underpin advancements that resonate across the field, driving its growth and maturation.

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